

I Claim:

1. A process for the in-situ preparation of a single-site transition metal olefin polymerization catalyst which comprises:

(a) forming a precatalyst by contacting a boron-containing ionizing agent with a neutral transition metal complex having at least one labile ligand capable of being removed and replaced with an alkyl group when contacted with an alkylating agent, and

(b) introducing the precatalyst into a polymerization system and forming an alkylated cationic transition metal catalyst by contacting with an organometallic alkylating agent.

2. The process of Claim 1 wherein the molar ratio of boron to transition metal in step (a) is from 0.1:1 to 10:1 and the molar ratio of alkylating agent metal to transition metal in step (b) is from 1:1 to 1000:1.

3. The process of Claim 2 wherein the precatalyst and organometallic alkylating agent are contacted in the presence of one or more C₂₋₁₂ α -olefin monomers.

4. The process of Claim 3 wherein contact of the precatalyst and organometallic alkylating agent is carried out under polymerization conditions.

5. The process of Claim 2 wherein the boron-containing ionizing agent and neutral transition metal complex are contacted in an inert hydrocarbon medium.

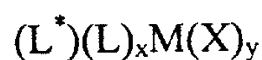
6. The process of Claim 1 wherein the neutral transition metal complex has the formula:



wherein M is a Group 3-10 metal, L is a bulky ancillary anionic polymerization-stable carbocyclic, heterocyclic or constrain-inducing ligand, X is a labile ligand, n is 1 to 4, m is 1 to 4 and n+m is equal to the valence of the metal and the boron-containing ionizing agent is a trialkyl borane, triaryl borane or ionic organoborate compound.

7. The process of Claim 6 wherein M is a Group 4-6 transition metal and X is hydrogen, halogen, C₁₋₂₀ alkoxy, C₆₋₂₀ aryloxy or alkyl-or-aryl-substituted amino.

8. The process of Claim 7 wherein the neutral transition metal complex has the formula



where M, L and X are the same as defined above, L* is a bulky ancillary anionic polymerization-stable heterocyclic ligand selected from the group consisting of boraaryl, pyrrolyl, azaboralinyll, quinolinyll and pyridinyll, x is 1 to 3, y is 1 to 3, x + y is equal to the valence of the metal minus 1 and X is halogen.

9. The process of Claim 6 wherein the boron-containing ionizing agent is an organoborate compound selected from the group consisting of N,N-dimethylanilinium tetra(pentafluorophenyl)borate and triphenylcarbenium tetrakis(pentafluorophenyl)borate.

10. The process of Claim 6 wherein the boron-containing ionizing agent is tripentafluorophenyl borane.

11. The process of Claim 6 wherein the organometallic alkylating agent is a Group 2 or 3 metal compound containing at least 1 alkyl group having from 1 to 8 carbon atoms.

12. The process of Claim 11 wherein the organometallic alkylating agent is selected from the group consisting of dialkyl zincs, dialkyl magnesiums, alkyl magnesium halides, alkyl aluminum dihalides, dialkyl aluminum halides and trialkyl aluminums.

13. The process of Claim 11 wherein the organometallic alkylating agent is an aluminium trialkyl wherein the alkyl groups contain from 1 to 4 carbon atoms.

14. A process for the in-situ preparation of a supported single-site transition metal olefin polymerization catalyst which comprises:

- (a) combining (1) a neutral transition metal complex containing at least one labile ligand which can be removed and replaced with an alkyl group when contacted with an alkylating agent; (2) a boron-containing ionizing agent; and (3) a support material; and (4) an inert hydrocarbon;
- (b) removing all or a portion of the inert hydrocarbon to obtain a supported transition metal precatalyst; and
- (c) introducing the supported transition metal precatalyst into a polymerization system and contacting with an organometallic alkylating agent to form a supported cationic transition metal catalyst.

15. The process of Claim 1 wherein the molar ratio of boron to transition metal in step (a) is from 0.1:1 to 10:1 and the molar ratio of alkylating agent metal to transition metal in step (c) is from 1:1 to 1000:1.

16. The process of Claim 14 wherein the support material is an inorganic oxide, inorganic silicate, inorganic chloride or organic polymer resin.

17. The process of Claim 16 wherein the support material is an inorganic oxide selected from the group consisting of silica, alumina, silica-alumina, magnesia, titania and zirconia.

18. The process of Claim 17 wherein the inorganic oxide support has a surface area from 10 to 700 m²/g, pore volume from 0.1 to 4 ml/g, average particle size from 10 to 500 μm and pore diameter from 10 to 1000 Å.

19. The process of Claim 18 wherein the support is silica.

20. The process of Claim 17 wherein the precatalyst contains from 0.001 to 0.5 mmole transition metal per gram of support.

21. The process of Claim 17 wherein the inorganic oxide support is pretreated to remove all or a portion of hydroxyl functionality present on the surface of the support.

22. The process of Claim 21 wherein the pretreatment is accomplished by thermal, chemical or a combination of thermal and chemical means.

23. The process of Claim 22 wherein thermal treatment is carried out by heating at 150°C to 800°C.

24. The process of Claim 22 wherein chemical treatment is carried out by contacting with a modifier selected from the group consisting of alumoxanes, alkyl aluminums, alkyl aluminum halides, alkylaluminum hydrides, alkylsilyl halides, alkylidisilazanes, alkyl and aryl alkoxysilanes, and alkyl, aryl, and alkoxy boron compounds.

25. The process of Claim 21 wherein substantially all surface hydroxyl functionality is removed.

26. The process of Claim 14 wherein the neutral transition metal complex has the formula:



wherein M is a Group 3-10 metal, L is a bulky ancillary anionic polymerization-stable carbocyclic, heterocyclic or constrain-inducing ligand, X is a labile ligand, n is 1 to 4, m is 1 to 4 and n+m is equal to the valence of the metal and the boron-containing ionizing agent is a trialkyl borane, triaryl borane or ionic organoborate compound.

27. The process of Claim 26 wherein M is a Group 4-6 transition metal and X is hydrogen, halogen or C₁₋₂₀ alkoxy, C₆₋₂₀ aryloxy or alkyl-or-aryl-substituted amino.

28. The process of Claim 27 wherein the neutral transition metal complex has the formula



where M, L and X are the same as defined above, L* is a bulky ancillary anionic polymerization-stable heterocyclic ligand selected from the group consisting of boraaryl, pyrrolyl, azaboralanyl, quinolanyl and pyridinyl, x is 1 to 3, y is 1 to 3, x + y is equal to the valence of the metal minus 1 and X is halogen.

29. The process of Claim 26 wherein the boron-containing ionizing agent is an organoborate compound selected from the group consisting of N,N-dimethylanilinium tetra(pentafluorophenyl)borate and triphenylcarbenium tetrakis(pentafluorophenyl)borate.

30. The process of Claim 26 wherein the boron-containing ionizing agent is tripentafluorophenyl borane.

31. The process of Claim 26 wherein the organometallic alkylating agent is a Group 2 or 3 metal compound containing at least 1 alkyl group having from 1 to 8 carbon atoms.

32. The process of Claim 31 wherein the organometallic alkylating agent is selected from the group consisting of dialkyl zincs, dialkyl magnesiums, alkyl magnesium halides, alkyl aluminum dihalides, dialkyl aluminum halides and trialkyl aluminums.

33. The process of Claim 32 wherein the organometallic alkylating agent is an aluminium trialkyl wherein the alkyl groups contain from 1 to 4 carbon atoms.

34. The process of Claim 14 wherein the supported precatalyst and organometallic alkylating agent are contacted in the presence of one or more C₂₋₁₂ α-olefin monomers.

35. The process of Claim 34 wherein contact of the supported precatalyst and organometallic alkylating agent is carried out under polymerization conditions.